

**A miniature, high-sensitivity, electron-tunneling accelerometer.** *Thomas B. Gabrielson (NAWC Aircraft Division, Code 5044, Warminster, PA 18974-0591), Howard K. Rockstad, and Tony K. Tang (Jet Propulsion Laboratory, Center for Space Microelectronics Technology, Pasadena, CA 91109-8099).*

A prototype low-noise accelerometer has been fabricated with an electron-tunneling transducer. By measuring the tunneling current between an electrode on the proof mass and a feedback-controlled monitor electrode, very small accelerations can be detected with high responsivity. This particular prototype (10x 10x 1.5 mm) was designed for underwater acoustic measurement from a few hertz to 1 kHz. The measured responsivity below the fundamental device resonance at 100 Hz is roughly 1500 volts per  $\text{m/s}^2$  with a measured noise spectral density of  $10^{-6} \text{ m/s}^2$  per root hertz or less between 30 and 300 Hz. The noise floor is controlled primarily by 1/f noise in the tunneling current although the noise floor reaches the theoretical molecular-agitation limit at 100 Hz. The responsivity and directivity of the device were measured in a standard gradient-hydrophone calibrator; the noise floor was determined in a vacuum-isolation chamber assembled from commercial off-the-shelf components; and the detailed dynamics of the proof-mass motion were examined using a heterodyne laser interferometer that was scanned across the surface and synchronously detected with respect to the excitation. [Work supported by the Office of Naval Research.]

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Telephone number: 215-441-1310 (T. Gabrielson)

Send notice to: T. Gabrielson

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